



Better Buildings Residential Network Peer Exchange Call Series:

*Getting Net Zero Upgrades to Scale – The Future is
Now*

July 11, 2019

Agenda and Ground Rules

- Agenda Review and Ground Rules
- Opening Poll
- Residential Network Overview and Upcoming Call Schedule
- Featured Speakers:
 - **Michael Walton**, green|spaces Chattanooga
 - **Kate Stephenson**, Montpelier Energy Advisory Committee
 - **Chris Ball**, City of Bloomfield, IA
- Open Discussion
- Closing Poll and Announcements

Ground Rules:

1. **Sales of services and commercial messages are not appropriate** during Peer Exchange Calls.
2. Calls are a safe place for discussion; **please do not attribute information to individuals** on the call.

The views expressed by speakers are their own, and do not reflect those of the Dept. of Energy.

Better Buildings Residential Network

Join the Network

Member Benefits:

- Recognition in media and publications
- Speaking opportunities
- Updates on latest trends
- Voluntary member initiatives
- One-on-One brainstorming conversations

Commitment:

- Members only need to provide *one number*: their organization's number of residential energy upgrades per year, or equivalent.

Upcoming Calls (2nd & 4th Thursdays):

- Jul 17: Bonus Episode! Meet the Winners of the 2019 Home Performance with ENERGY STAR Awards
- Jul 25: Connected Homes and the Grid – Flipping the Switch on the Script
- Aug 8: Home Performance and Real Estate

Peer Exchange Call summaries are posted on the Better Buildings [website](#) a few weeks after the call

For more information or to join, for no cost, email

bbresidentialnetwork@ee.doe.gov, or go to energy.gov/eere/bbrn & click Join



Kate Stephenson
Montpelier Energy Advisory Committee

NET ZERO MONTPELIER

Kate Stephenson
Montpelier Energy Advisory Committee Chair



MONTPELIER ENERGY
ADVISORY COMMITTEE

WWW.NETZEROMONTPELIER.ORG

An aerial photograph of a solar farm with rows of blue photovoltaic panels installed on a green lawn. The panels are arranged in a grid pattern, and the grass is visible between the rows. The image is partially obscured by a large orange semi-transparent rectangle that serves as a background for the text.

Montpelier defines the City's Net Zero Goal as:

1. Montpelier is committed to becoming the first capital city to eliminate fossil fuel use by converting to 100% renewable energy.
2. By 2030, 100% of the energy used for municipal government operations (thermal, electrical, and transportation) will be renewable or offset.
3. By 2050, fossil fuel use will be eliminated entirely and 100% of energy needs (municipal, residential, and commercial) will be met renewably.



MUNICIPAL

buildings, fleet,
operations



PLANNING

master plan, energy
plan, zoning rewrite

TRANSPORTATION

alternative transit,
EVs, bike/ped

RESIDENTIAL

homeowner and
landlord outreach



RESIDENTIAL PROJECTS



ButtonUp Campaign

Weatherize Montpelier

Landlord Outreach

Ordinance Development

Modern Wood Heat

Residential Solar



Concierge Services for Landlords

- Pilot with Efficiency Vermont focused on rental property weatherization
- Targeted outreach to 450+ multifamily building owners
- Free building walk throughs and follow up energy audits
- Identify available funding sources for weatherization
- Help filling out paperwork for incentives and financing
- Project management support - getting contractor quotes



Weatherize Montpelier



Partnership with four local
weatherization contractors

Targeted 3 month campaign to
generate project leads via intake
questionnaire

63 free walk throughs generated 15
contracts signed



MONTPELIER ENERGY
ADVISORY COMMITTEE

WWW.NETZEROMONTPELIER.ORG

Potential Ordinances

- Time of Listing Energy Labeling/Disclosure
- Rental Property Energy Disclosure
- Bring Multi-family Buildings up to Energy Code at Time of Sale



MUNICIPAL PROJECTS



1 MW Municipal Solar

Retrocommissioning

Revolving Loan Fund

Muni Building Audits

District Heat

Organics to Energy

An aerial photograph of a solar farm. The solar panels are arranged in neat, parallel rows, creating a grid pattern. The panels are a deep blue color with white lines separating the cells. The solar farm is situated on a lush green lawn. The top half of the image is partially obscured by a semi-transparent orange banner that contains the title and introductory text.

MUNICIPAL REVOLVING LOAN FUND

The purpose of the Fund is to capture and track savings from municipal sustainability projects and to utilize part of those savings for subsequent projects.



HISTORY

Spring 2016: MEAC reached out to the Sustainable Endowments Institute for help in setting up the Revolving Loan Fund.

Summer 2016: We formed a Revolving Loan Committee made up of 3 city staff and 3 MEAC members to review loan proposals.

Fall 2016: Montpelier City Council allocated \$20,000 from the Reserve Fund to establish a green revolving loan fund for municipal energy projects. Efficiency Vermont offered to match with an additional \$10,000.

Winter 2017: Committee developed guidelines and loan application process. Set up GRITS database to track projects.

Spring 2017: RFP issued for energy audits of 6 municipal buildings

Winter 2018: Audit report completed by Cx Associates

Spring 2018: One-on-one meetings with city staff to review audit recommendations

Fall 2018: First projects underway



Revolving Loan Fund Projects

PROJECTS COMPLETED

1. Capacitor at Water Treatment Plant
2. Insulation on district heat pipes to Fire Station
3. Replaced controls on snowmelt system at Fire Station
4. Replaced storm windows at DPW
5. Replaced house lights in City Hall theater with LEDs

PROJECTS IN PROGRESS

1. Weatherstripping City Hall Windows
2. Repairs to overhead doors



PROJECT TRACKING



City of Montpelier

TOTAL PROJECTS
FUNDED
(COMPLETED /
IN-PROGRESS)
4 / 3

TOTAL INVESTED
TO DATE *
\$ 17,353

MEDIAN
PAYBACK PERIOD
0.76 years

MEDIAN ANNUAL
FINANCIAL
SAVINGS
\$ 2,700

MEDIAN ANNUAL
ENERGY SAVINGS
216.00 mmbtu

TOTAL FINANCIAL
SAVINGS TO DATE
\$ 7,989

TOTAL ENERGY
SAVINGS TO DATE
189 mmbtu

TOTAL EMISSIONS
ABATED TO DATE
18 MTCO₂e

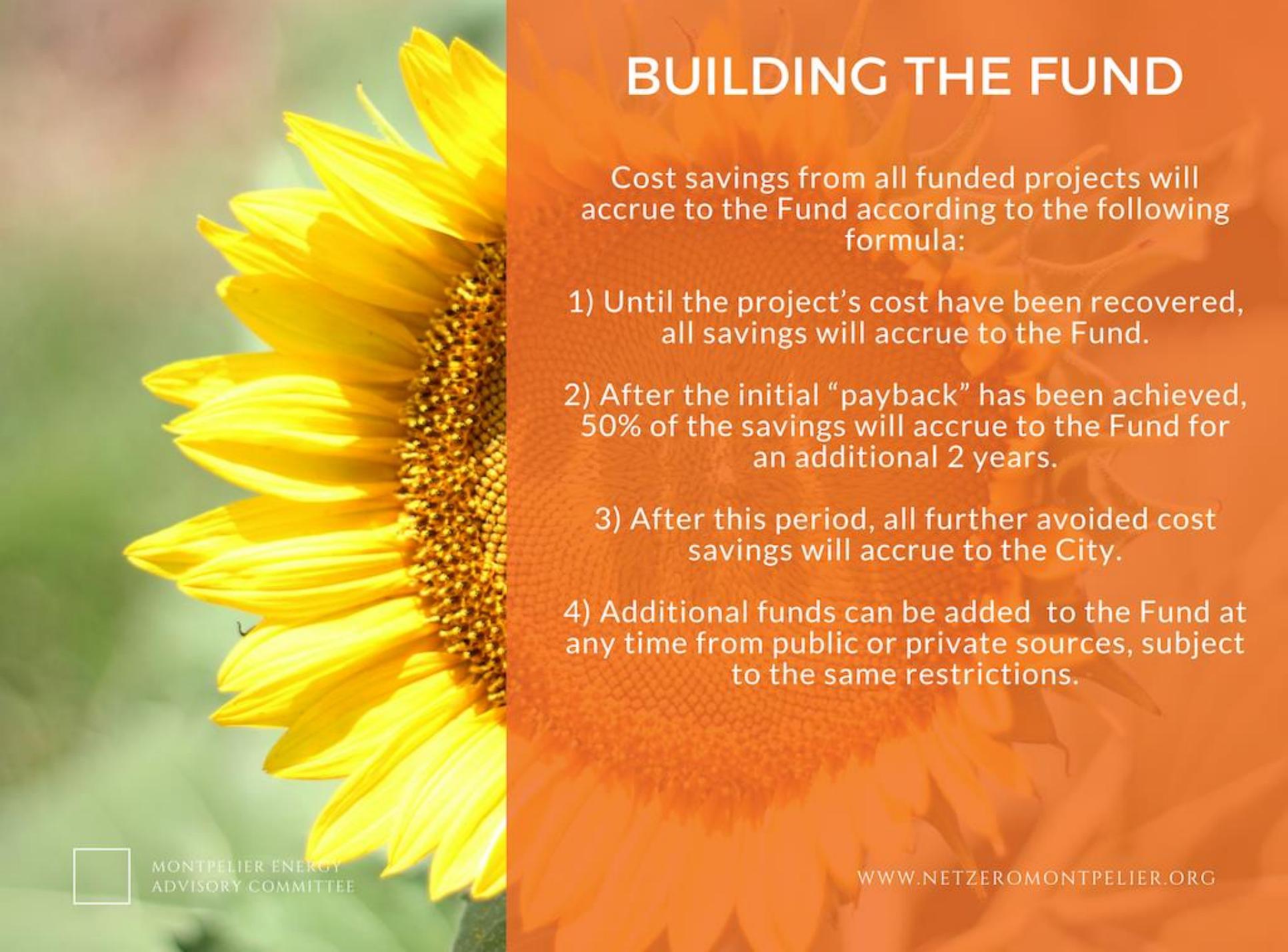
Efficiency data powered by  GRITS

* Includes investments to in-progress projects without savings to date
Last updated 07/08/2019



<input type="checkbox"/>	PROJECT	STATUS ▲	INSTALL COMPLETE DATE	TYPE	Actual or Projected			Annual Savings		
					COST	ANNUAL ROI	PAYBACK (YRS)	EMISSIONS (MTCO2E)	ENERGY (MMBTU)	WATER (GAL)
<input type="checkbox"/>	Capacitor	Completed	04/03/2017	○ Metering/Energy Data Monitoring and Control Systems	\$ 2,700	78.6%	1.1	0	0	0
<input type="checkbox"/>	City Hall Theatre House Lights	Completed	01/11/2019	○ Lighting	\$ 5,453	1.0%	9.1	2	15	0
<input type="checkbox"/>	Fire Station Snowmelt Controls ¹	Completed	04/30/2019	○ Metering/Energy Data Monitoring and Control Systems	\$ 444	1,158.1%	0.1	39	410	0
<input type="checkbox"/>	Fire Station Snowmelt Loop Insulation ²	Completed	01/16/2019	○ Building Heating, Ventilation, Air Conditioning (HVAC)	\$ 1,046	254.1%	0.4	21	216	0





BUILDING THE FUND

Cost savings from all funded projects will accrue to the Fund according to the following formula:

- 1) Until the project's cost have been recovered, all savings will accrue to the Fund.
- 2) After the initial "payback" has been achieved, 50% of the savings will accrue to the Fund for an additional 2 years.
- 3) After this period, all further avoided cost savings will accrue to the City.
- 4) Additional funds can be added to the Fund at any time from public or private sources, subject to the same restrictions.





LEARN MORE

EMAIL

netzeromontpelier@gmail.com

WEBSITE

www.netzeromontpelier.org

MONTPELIER ENERGY
ADVISORY COMMITTEE

Key Points

- Montpelier is committed to becoming the first capital city to convert to 100% renewable energy.
- Residential-specific aspects of this plan include weatherization efforts, landlord outreach, ordinance development, modern wood heat and residential solar.
- Potential ordinances include time of listing energy disclosure, rental property energy disclosure, and bringing multi-family buildings up to energy code at time of sale.



Chris Ball
City of Bloomfield, Iowa



Community Energy Independence

Chris Ball
Community Development Director
City of Bloomfield, Iowa



Bloomfield?

The Community



- Rural Iowa
- 2,640 People
- Interest in Community
- Independent
- Largest employers
 - Hospital
 - School
 - Light manufacturing

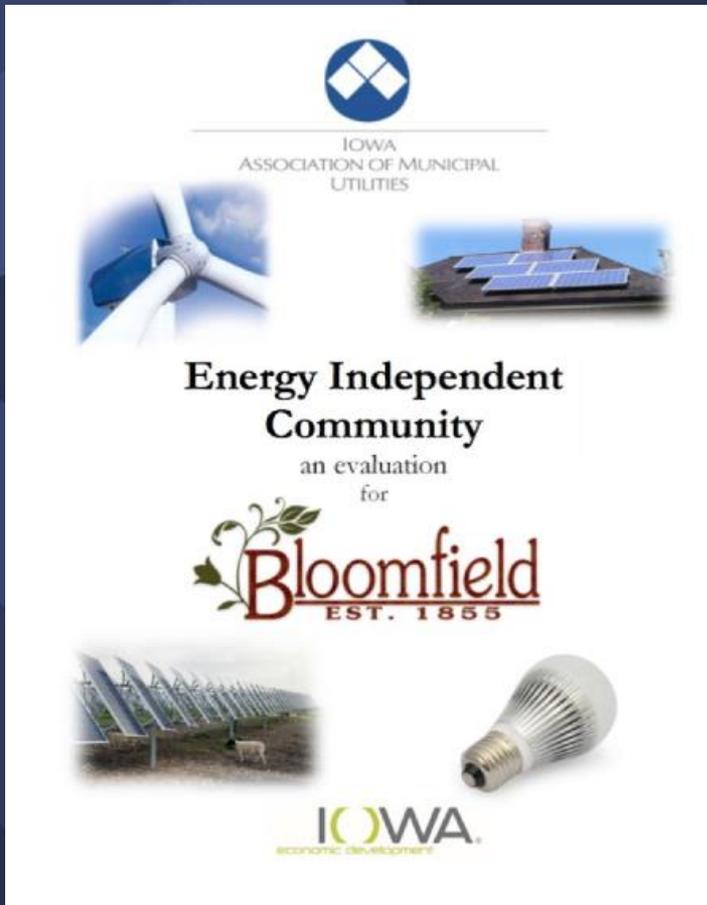
Municipal Electric Utility

- 1,100 Residential
- 250 Commercial/Industrial
- 27,000 MWh/year
- 45% Residential
- 45% Small Commercial
- Peaks driven by residential air conditioning



Why Energy Independence?

Study Results



- Net Zero is Possible
- Reduce consumption by 25%
- Add renewable generation
- Maintain existing generation



Objectives

- ① Establish a shared understand of current situation and a shared vision of project
- Shared vision of project
- Shared approaches
- Shared plans

explain
→ Group

What are the objectives of the project?

How to use the LEGO model?

How to use the LEGO model?

How to use the LEGO model?

Local Energy Local Money

Resilience

Prestige

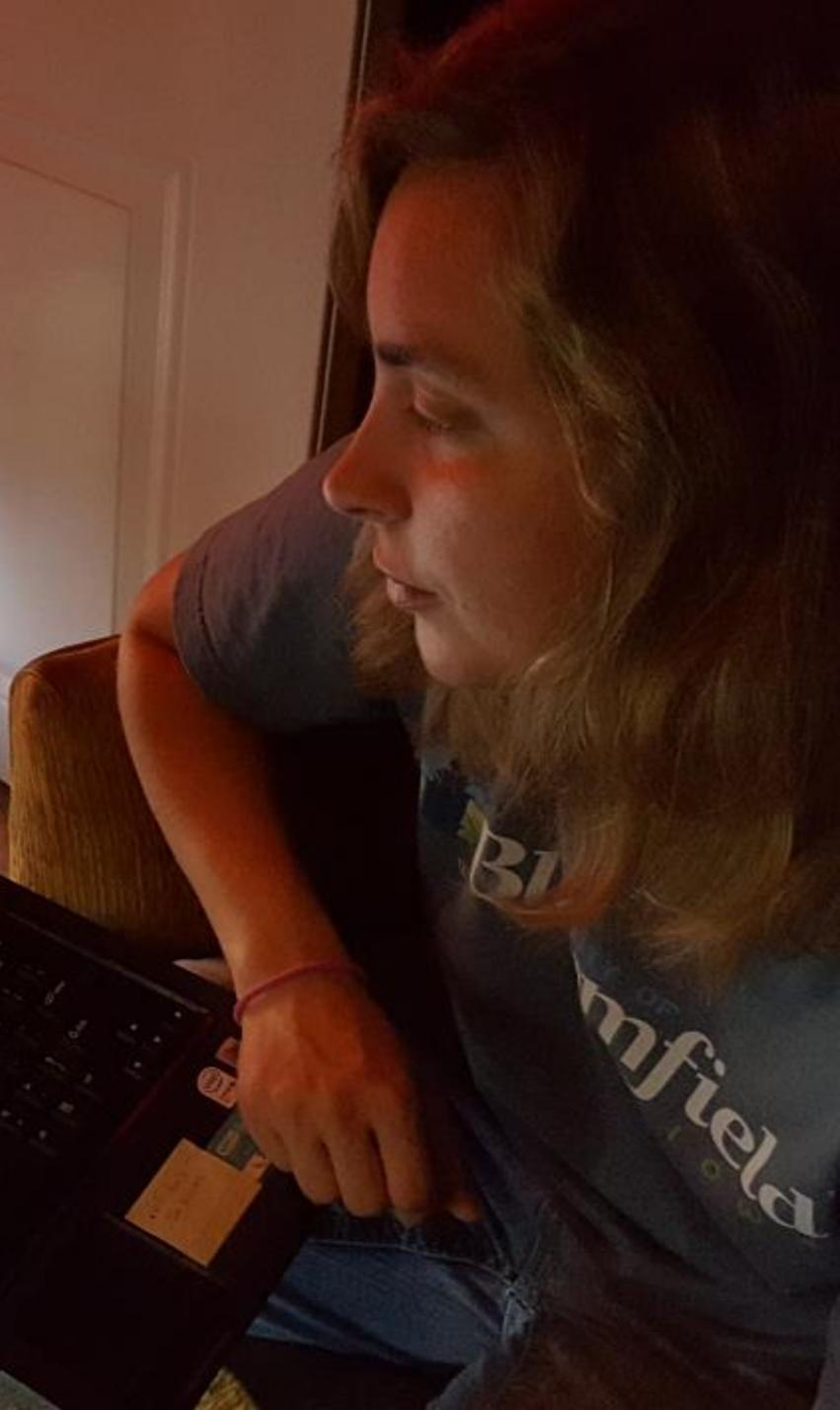
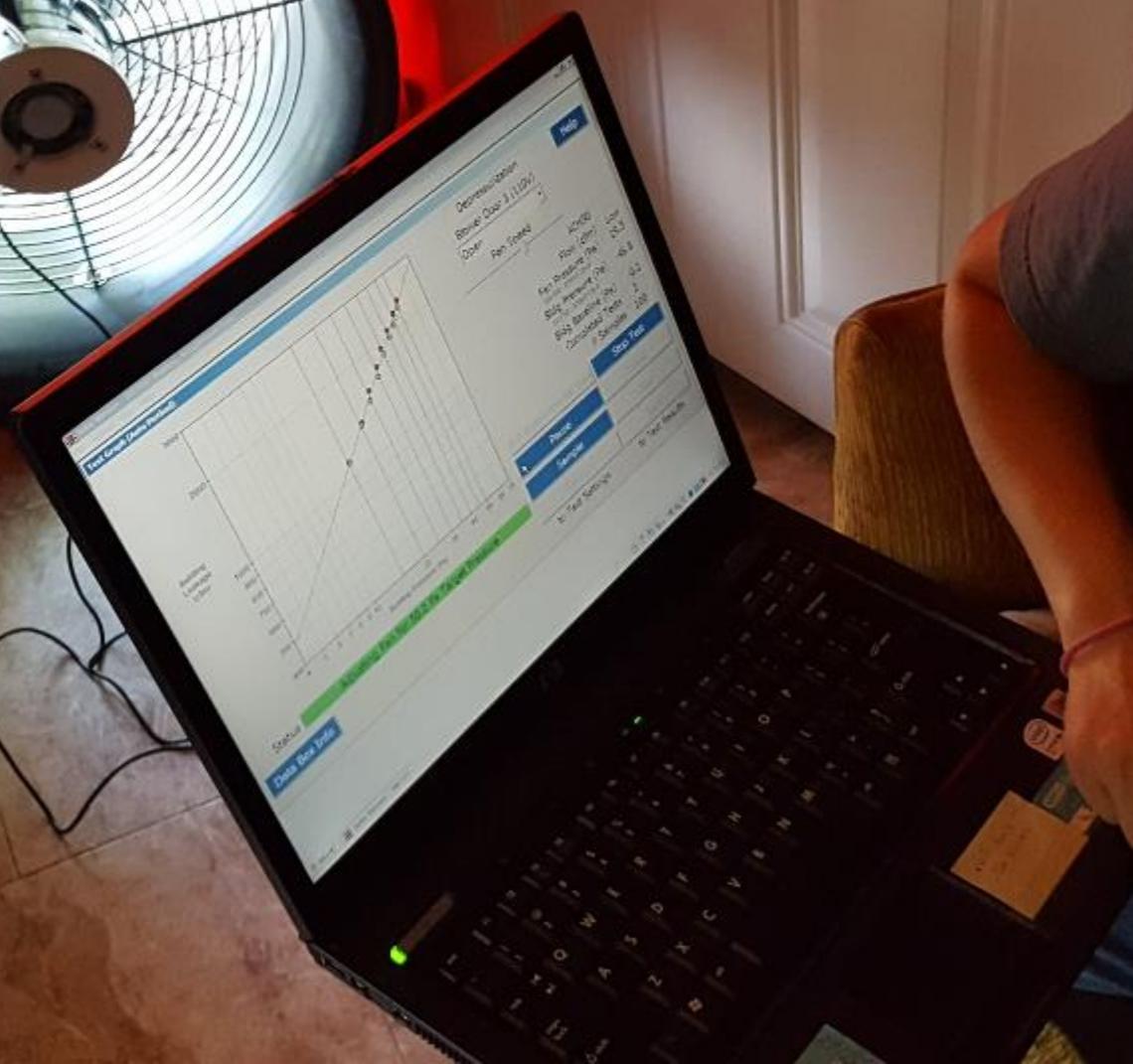
Vision

Creating a new foundation for prosperity through local energy innovation

Mission

We are on a path to be an Energy Independent Community through Bloomfield's legacy of resourcefulness and excellence to ensure health, prosperity, and resiliency for the next 150 years

What Have We Done?





SUMMER OF LIGHT

**ENERGY INDEPENDENT BLOOMFIELD
10 FREE A19 60W EQUIVALENT, ENERGY STAR RATED LED
LIGHTBULBS AND REPLACEMENTS**

**HOW MANY PEOPLE DOES
IT TAKE TO SCREW
IN 10 LIGHT BULBS?
DOESN'T MATTER IT'S FREE!**

**TO SCHEDULE VISIT:
WWW.EIB.YOUCANBOOK.ME**



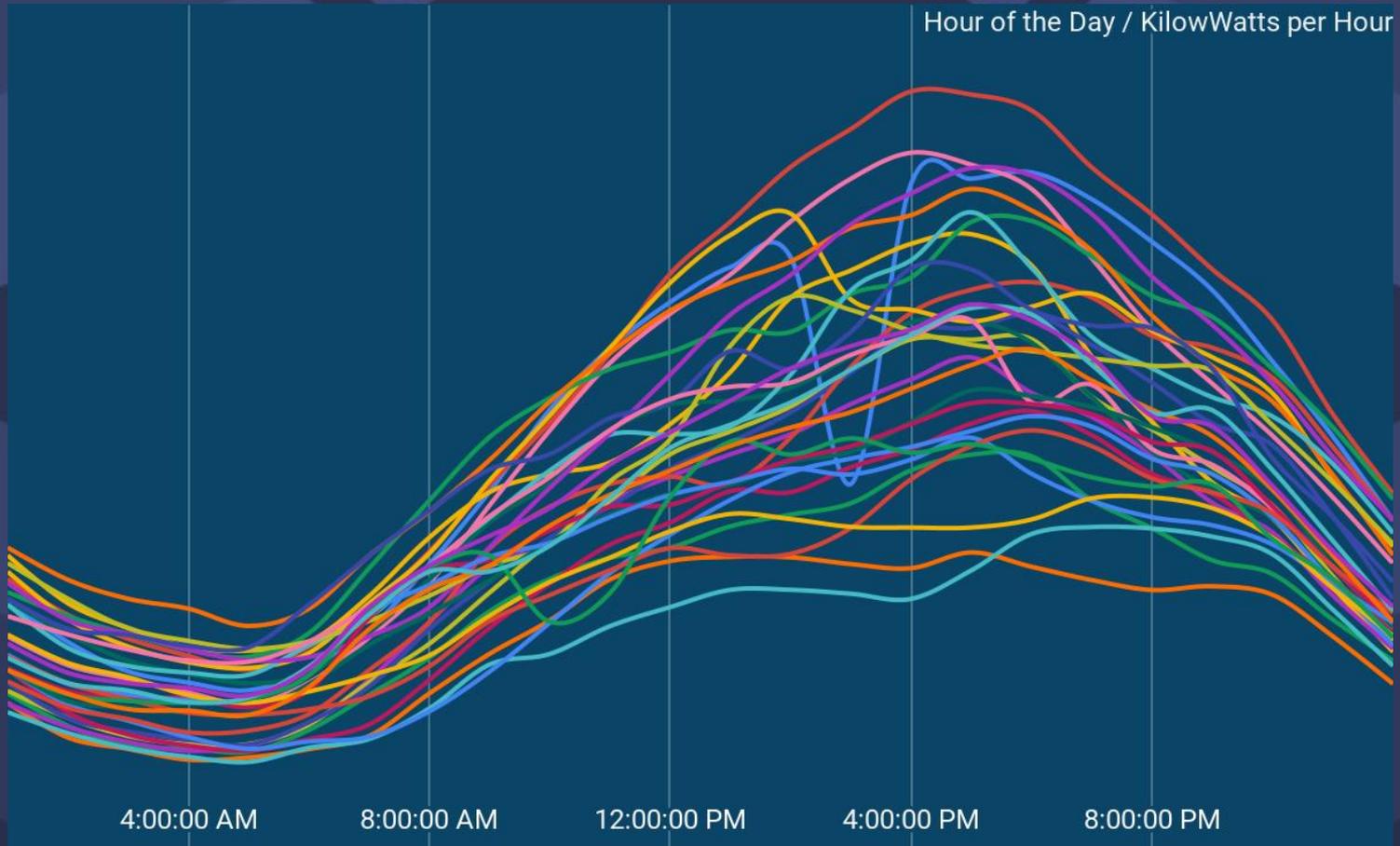


Results to Date?

- 10% of energy is produced locally through solar
- Large Commercial energy consumption is down
- No change in residential energy consumption

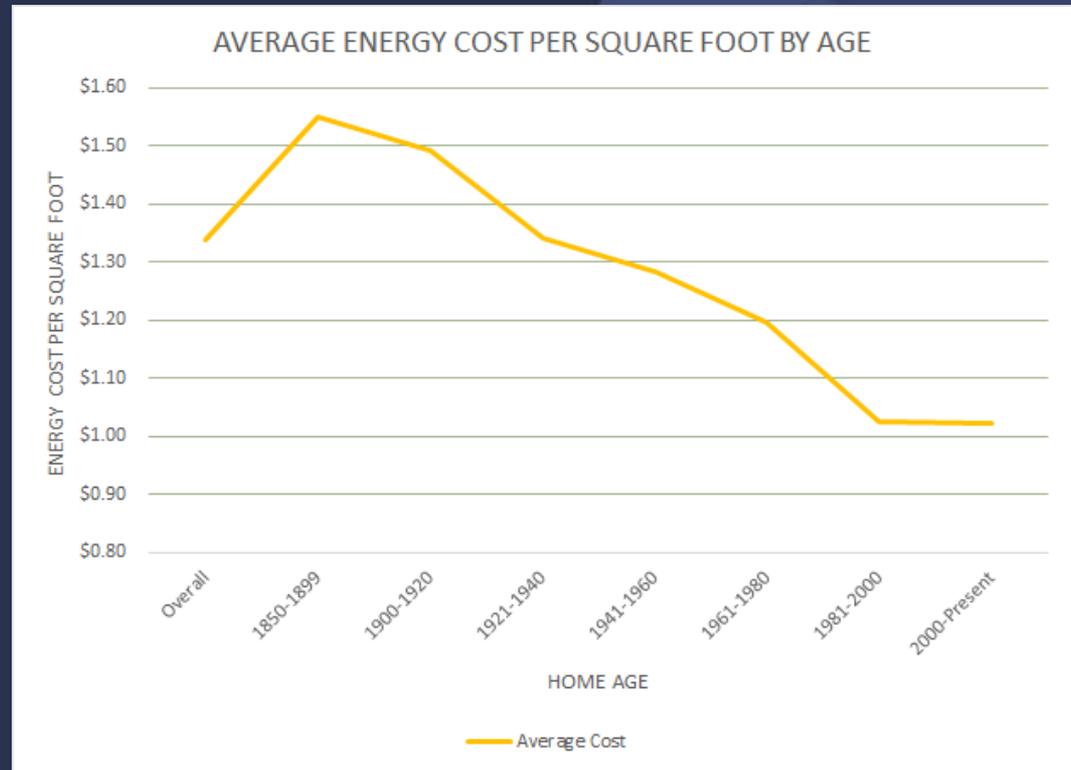
Why No Change in Consumption?

Hourly Consumption August '17

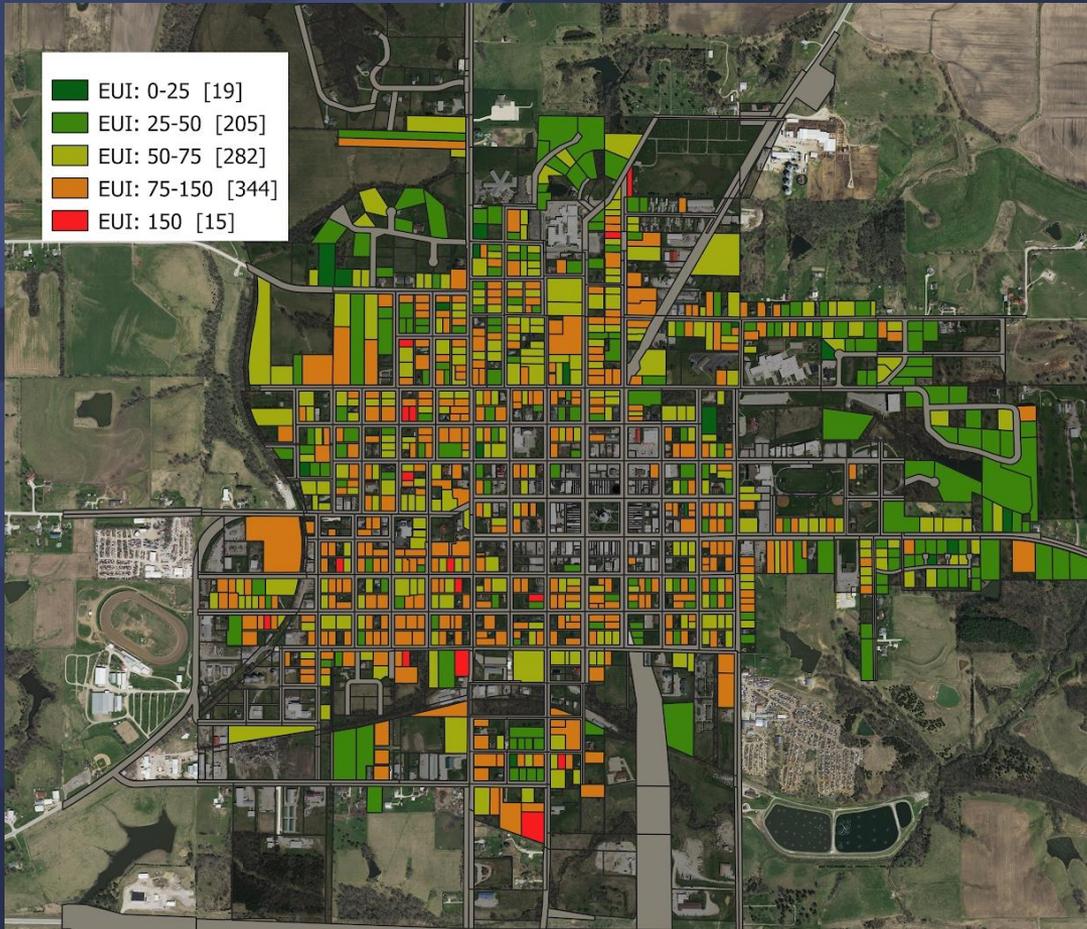


Aging Housing Stock

- Median build year is 1937
- 81.7% built before 1980
- Older homes are less efficient



Inefficient Homes



Site EUI

New Home

15

Midwest Average

49

Bloomfield Average

75

What Do We Do?

Upgrade Housing Stock

- Air Sealing
- Insulation
- Heating and Air Conditioning Upgrades

Homes are more efficient, comfortable,
and healthier

Tool - Inclusive Financing

- Municipal Utility invests in residential efficiency
- Investments tied to meter – not occupant
- Investments are recouped on utility bill

Challenges

- Hasn't been done in Iowa
- Contractors are in high demand
- Contractors need trained
- Need startup capital

Steps We Have Taken

- Engaged community in planning process, report finalized soon
- Identified 3rd Party partner
 - Audit homes
 - Recommend energy efficiency measures
 - Train contractors
- Municipal Utility has committed to funding \$750k

Questions?

Key Points

- Bloomfield commissioned a study which determined that reaching net-zero is possible and feasible.
- Aged and inefficient housing stock has been targeted for air sealing, insulation and HVAC upgrades.
- A large solar array was installed to add renewable power generation.



Michael Walton
green|spaces Chattanooga



green|spaces

Advancing the sustainability of living, working, and building in Chattanooga and the surrounding region.

Empower

CHATTANOOGA

EMPOWER CHATTANOOGA

Build it Green Workforce Development

The average age of workers in the construction industry is almost 50 and for every 5 retiring, there is just 1 person replacing them. The shortage of qualified labor has substantially increased construction costs in the Chattanooga market.

Launched in 2018 with Build Me a World, from a grant in partnership with EPB and the City of Chattanooga, Build it Green recruits at-risk young men and women (ages 18-36) from Empower neighborhoods for a 12 week, paid, leadership and workforce development program. 100% of trainees graduated or left early with a job.

All graduates received OSHA-10 Certification and lead paint abatement certification. 90% of graduates are currently employed.



EMPOWER CHATTANOOGA

Build it Green Work Team

Social enterprise employing Build it Green graduates in partnership with a local contractor to make energy efficiency improvements to homes of Empower Workshop attendees and nonprofit partners.

Work will include:

- Blown-in cellulose insulation
- Air sealing
- Painting
- Repairs



EMPOWER CHATTANOOGA

Federal Home Loan Bank of Cincinnati

TVA/EPB Home Energy Upgrade

Home Energy Upgrade provides Deep Energy Retrofits to qualifying residents. Current program focuses on homeowners w/ income of 50% AMI or less and are either elderly or special needs.

Scope of work includes

- Insulation
- Airsealing
- HVAC
- Windows and Doors
- Appliances



EMPOWER CHATTANOOGA

Chattanooga Green Prix

Launched in 2018, green|spaces purchased 9 kits of parts for elementary schools, middle schools, and high schools with support from the Lyndhurst Foundation and TVA.

Students had to take these parts, build fully functional electric racecars, design and build their own body, and then race the cars around a track set up by the local Sports Car Club of America at Chattanooga State Community College.

The inaugural event was so successful, green|spaces raised enough funds to purchase kits for 25 more schools. Along with visiting schools, we had over 50 student-built EVs at the 2019 Green Prix





green|light

GREEN|LIGHT

Chattanooga's Green Business Certification

green|light helps businesses identify simple, cost-effective ways to reduce their environmental impact and build a culture of sustainability in their business. The result is better customer recognition, employee attraction and retention, and lower operating costs.

We also host Sustainability Professionals of Greater Chattanooga, a forum for sustainability directors and professionals in the Chattanooga Region.

In addition, we are developing a green|leader certification program for aspiring sustainability professionals that go through a 6 week course that teaches foundational knowledge about global, regional and local environmental issues, analysis tools for organizations, and strategies to help make change within the culture and operation of that organization.

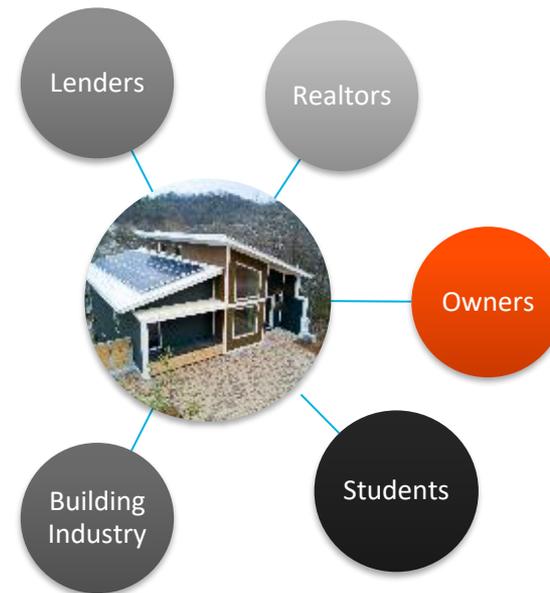


NEXTGEN HOMES

NEXTGEN HOMES

Demonstration Development

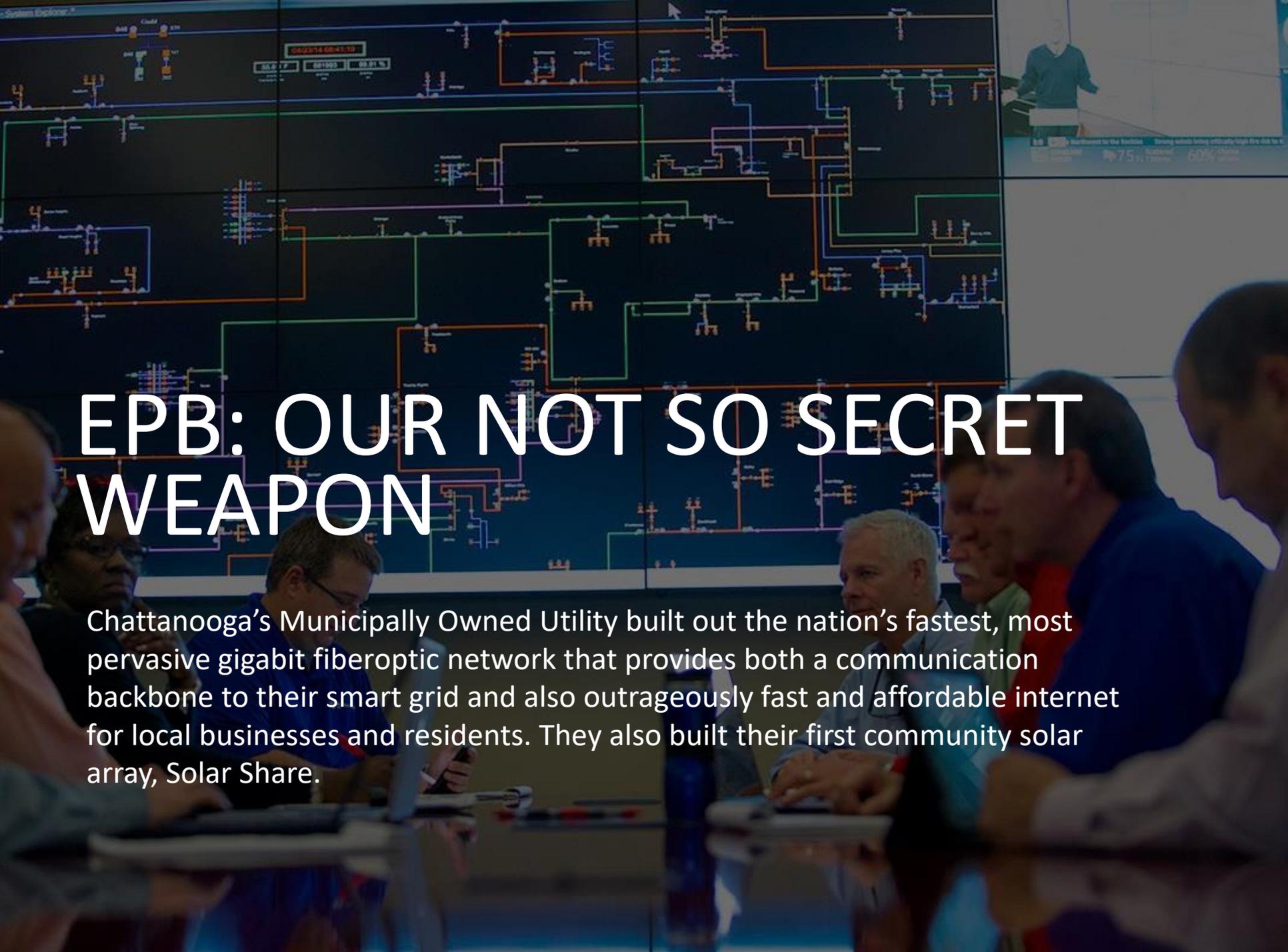
Completed in 2018, the NextGen Homes were developed by green | spaces, built at market rate, and sold at market rate, to educate the entire residential supply chain about simple, cost-effective building strategies that allow homes to produce as much energy as they consume. In addition, they protect and promote the health of occupants with whole house ventilation and healthy materials, treat stormwater naturally with native planting and pervious pavers, and use water and materials efficiently. Most importantly they accomplished all this at between \$160-175/SF and were able to be sold at between \$200-215/SF before construction even started!







SCALING ZERO IN CHATTANOOGA



EPB: OUR NOT SO SECRET WEAPON

Chattanooga's Municipally Owned Utility built out the nation's fastest, most pervasive gigabit fiberoptic network that provides both a communication backbone to their smart grid and also outrageously fast and affordable internet for local businesses and residents. They also built their first community solar array, Solar Share.

Quick Facts

- Located on 3.8 acres along Holtzclaw Avenue in downtown Chattanooga
- 4,408 solar panels
- Total power output of nearly 2 million kWh per year
- Output equates to enough power to supply the needs of about 130 average size homes



EPB Solar Share Production

Powered by Dark Sky

Mon, Jul 8
85° | Partly Cloudy



Current Generation

0 kW

Total Solar Energy Generation to Date: 3.84 GWh

<p>CO² Saved</p> <p>2,879</p> <p>Tons Coal Burned</p>	<p>CO² Offset Equals</p> <p>69,177</p> <p>Trees Planted</p>	<p>Energy Generated Equals</p> <p>6.47 M</p> <p>Miles Driven</p>
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**Solar Share has
equivalent of 293
NextGen Homes worth
of panels.**

**Now we are working
with developers that
want to develop
community-scaled solar
in new subdivisions.**







CHATTANOOGA AIRPORT FIRST SITE NET ZERO AIRPORT IN UNITED STATES

The Chattanooga Airport completed their 2.64 MW Solar Array after multiple LEED certified facilities, stormwater systems, green infrastructure and electric car charging stations. EPB also partnered with TVA and ORNL to deploy utility scale storage as part of a nested micro-grid within EPB's smart grid that can power both the airport and surrounding neighborhoods for a period of time before only providing power to the airport for a longer period of time.

LOCAL ZERO ENERGY
STANDARD IN DEVELOPMENT
W/ EPB
(CLIMATE ZONE 4)
(IECC 2012)

Envelope

Advanced Framing

2x6 Studs

24" on Center

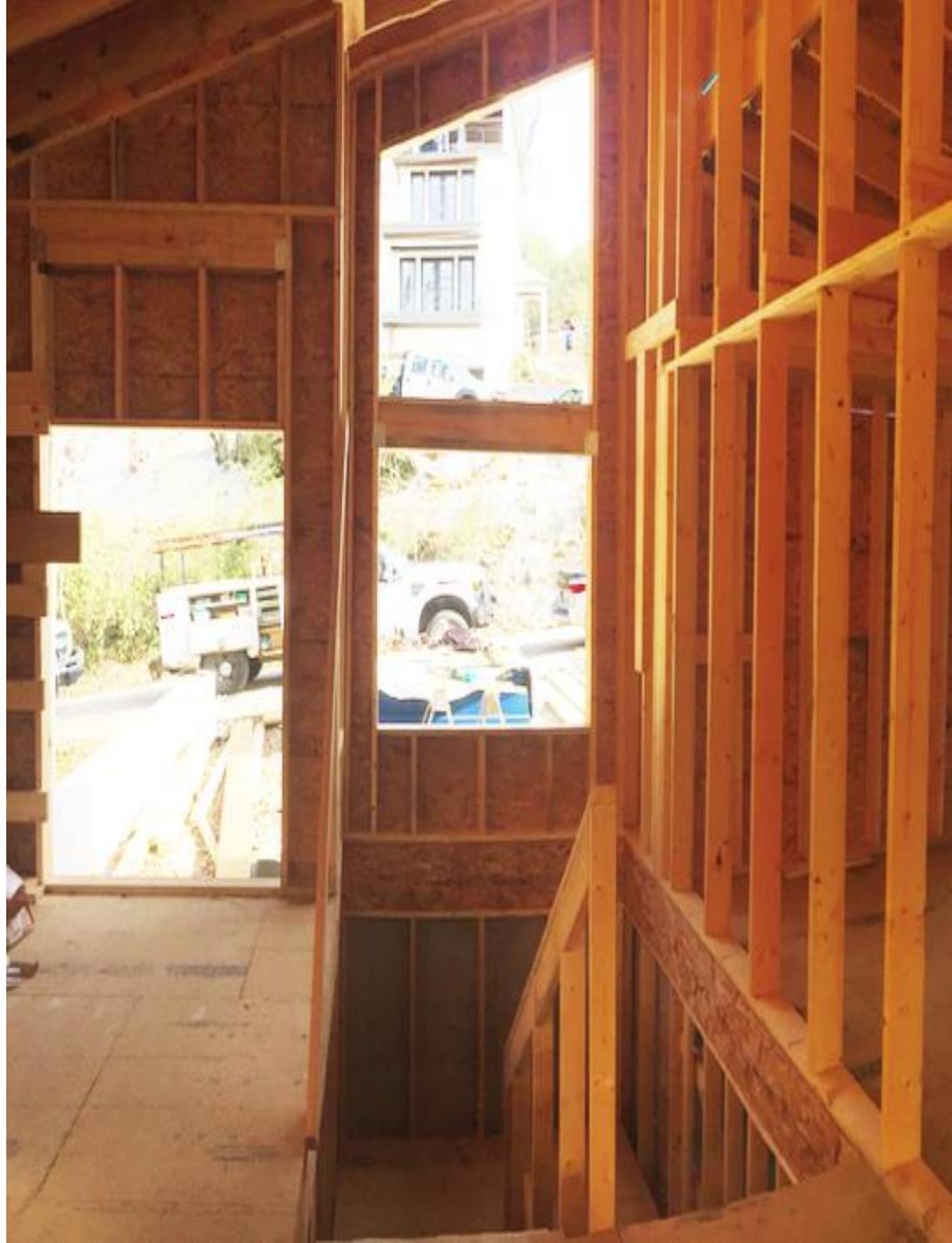
Header Hangers

Drywall Clips

California Corners

Ladder Junctions

(or SIPS/ICF)



Windows and Doors

Energy Star ZER

<0.25 SHGC

<0.3 U-factor

Aluminum clad wood frames

Casement windows

Doors with multipoint locks



Envelope – Air Sealing

Blower door test @ 50pa:

2.0 or less ACH 50

(Check out new pressurized aerated silicon mist for new construction and retrofits)



Envelope – Insulation

-Blown in Insulation

- Cellulose
- Open Cell or Closed Cell Spray Foam (esp. crawlspaces)

-Continuous Insulation

-Grade 1 HDFG, Rock Wool or similar



Envelope – Insulation

Best bang for your buck for renovations in Climate Zone 4:

- Blown in cellulose in attic after air sealing.
- Rigid foam nailbase over decking for cathedral ceilings



Heating & Air Conditioning (Req's)

- HSPF 9
(Heating Seasonal Performance Factor)
- SEER 15
(Seasonal Energy Efficiency Ratio)
- AFUE 90%
(Annual Fuel Utilization Efficiency)



Heating & Air Conditioning (Recs)

- Ductless Mini Splits
(SEER 28 for 1-1)
- Variable Capacity Heat Pumps
(20.5 SEER w/ Dehum & reheat)
- Dual Fuel Heat Pump w/
Biogas?
- Energy Recovery Ventilator or
Heat Recovery Ventilator after
< 3.0ACH



Lighting

95% LED Lamps Required,
because..... chicken coops?

Really just use LEDs



Appliances

Heat Pump or Solar Hot
Water Heater

Gas HWH w/ Biogas?

All Energy Star
Appliances

Check out Heat Pump
Dryers



Smart Home Features

- Gigabit enabled
- Smart/Programmable Thermostat w/ Demand Response
- Phase II EV Charger or Higher w/ Demand Response



Air Quality

- Zero VOC paint
- Low or no VOC sealants, stains, adhesives.
- Greenguard certified carpet
- Greenguard certified and/or use of cellulose insulation



Solar Analysis

- On site solar
(if applicable)
- On site community solar
(if available)
- Off-site community solar
(Solar Share)
- HERS of 0 Required





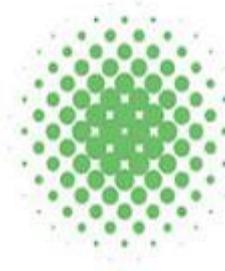
green|spaces

michael@greenspaceschattanooga.org

@waltonarchitect

423.648.0963

Empower
CHATTANOOGA



green|light

NextGen Homes

Key Points

- Chattanooga has invested heavily in workforce development, solar infrastructure, home upgrades and other channels in pursuit of net zero.
- An innovative “solar share” program allows homeowners to purchase electricity from a network of solar panels for their own use.
- Building codes will emphasize efficiency as well as holistic factors such as indoor air quality.

Explore the Residential Program Solution Center

Resources to help improve your program and reach energy efficiency targets:

- [Handbooks](#) - explain *why* and *how* to implement specific stages of a program.
- [Quick Answers](#) - provide answers and resources for common questions.
- [Proven Practices](#) posts - include lessons learned, examples, and helpful tips from successful programs.
- [Technology Solutions](#) **NEW!** - present resources on advanced technologies, **HVAC & Heat Pump Water Heaters**, including installation guidance, marketing strategies, & potential savings.



<https://rpssc.energy.gov>

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Please send any follow-up questions
or future call topic ideas to:

bbresidentialnetwork@ee.doe.gov